

**NATIONAL AERONAUTICS AND SPACE ADMINISTRATION  
GLENN RESEARCH CENTER  
21000 BROOKPARK ROAD  
CLEVELAND, OHIO 44135**

**STATEMENT OF WORK  
CONSTRUCTION SERVICES  
FOR**

**FY14 CENTRAL COMPRESSED AIR SYSTEMS REPAIRS, PHASE 1**

**PROJECT ID No. 20195**

## Change Record

Revision	Effective Date	Description
Baseline	03/31/2014	Baseline
Issued	04/21/2014	Issued for Proposal
Issued	04/25/2014	Amended to include Bid Option #2

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## **PART 1 GENERAL**

### **1.01 DESCRIPTION**

This project provides for critical repairs and refurbishment of Central Compress Air System equipment at Glenn Research Center's Lewis Field campus. Age and condition of the existing system dictates that infrastructure be repaired or replaced to promote safety, reliability and efficiency of operations for the Center. Three primary efforts will be conducted under Phase 1 of this project:

- 1) Installation of a new 125 PSIG, 5 lbm/sec service air compressor in Building 64.
- 2) Installation of a new desiccant dryer unit to accompany (1) in Building 64.
- 3) Re-winding of the 5000HP motor for compressor unit C4 in Building 5. [BID OPTION #1]

This Statement of Work describes the nature and extent of the construction services required for the following project located at the National Aeronautics and Space Administration, Glenn Research Center, 21000 Brookpark Road, Cleveland, Ohio 44135.

### **1.02 BACKGROUND**

Purpose of this project is to install and activate a new service air compressor (SA24 in the Central Air Equipment Building, Building 64. The new compressor will have 5 lbm/sec at 125 PSIG capability.

The existing service air system at Lewis Field supplies 125 PSIG compressed dry air to approximately eighty (80) buildings throughout the Lewis Field campus. Service air is used for various purposes including research, instrumentation, shop tools, pneumatic controls, etc. There are four reciprocating piston Ingersoll-Rand compressors currently used in this system. Three of the compressors are located in Engine Research Building (ERB), Building 5 basement and one is located in Building 24. Each compressor is rated for 3 lbm/sec at a discharge pressure of 125 PSIG. The compressed air is filtered to remove water and oil droplets and dried using a refrigeration system and desiccant dryers.

The current Master Plan for Lewis Field will demolish Building 24 in next two to three years. With this action, Service Air Compressor No. 23 (SA23) will be removed from service, effectively reducing the total capacity of the service air system by 25%. In reality current service air capability is barely adequate to meet the demands of the Center. A system study performed in 1992 concluded that the overall service air capability is inadequate and that the South campus area (where SA23 primarily supplies the air) should be enhanced with additional capabilities to meet the user demand. Unfortunately, during the years following the study no project was funded to follow up with the recommendations coming out of this study. With the current plan to demolish Building 24 the capability to provide service air to the buildings located in South campus area will be greatly diminished. There are numerous research facilities including materials research facilities and space power facilities located in the South campus area whose missions would be adversely impacted if the full capability were not maintained.

Also detracting from the state of the current service air system is the overall condition of the compressors themselves. These air compressors (including SA23) were built in 1940's. The upkeep and repair of these machines has been done over the recent years using parts cannibalized from five compressors of similar vintage that were retired at the Plum Brook Station facility. The major parts, such high and low pressure cylinders, main bearings, and piston rods from these compressors have been scavenged for the repair and upkeep of machines at Lewis Field. The decreasing availability of repair parts and ever increasing frequency of breakdown of the compressors has placed the Central Compressed Service Air System at risk of failing to meet the Center's needs. This project will replace SA23 compressor and its accompanying desiccant dryer with new modern equipment to be located in Building 64.

The last planned element in Phase 1 is the re-winding of the 5000HP synchronous motor for the 450 PSIG Combustion Air Compressor Unit C-4. This compressor operates approximately sixteen hours per day, supplying 450 PSIG combustion air to a number for Lewis Field research facilities. As one of only three combustion air compressors, it is relied upon heavily to meet the Center's demands. The motor

was last re-wound in the early 1980's. Given the heavy usage of this compressor and the fact that the motor is beyond the useful winding life, the re-winding is viewed as a critical improvement on reliability and maintainability of the combustion air system.

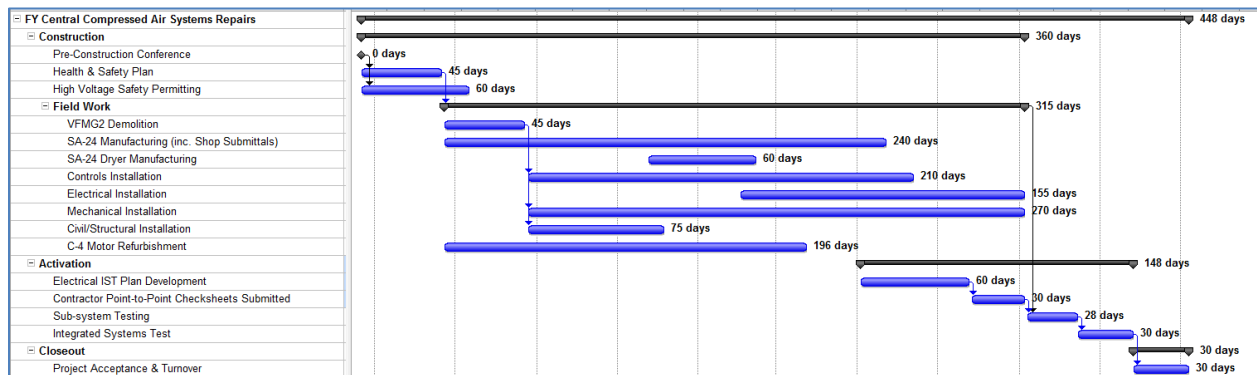
### 1.03 SCOPE

The scope of this project is as follows:

- 1) Demolish the Variable Frequency Motor Generator (VFMG) set #1 & #2 located Building 64 including foundations, electrical controls, liquid rheostat, miscellaneous related equipment and structures.
- 2) Procure, install and activate a new centrifugal service air compressor, designated SA24, and desiccant dryer system. This includes the associated high and low voltage electrical systems, process piping, foundations and structures, and integrated controls.
- 3) Remove, refurbish, re-install and re-activate the existing 5000HP synchronous motor for compressor C-4 located in the basement of the Engine Research Building, Bldg 5. [BID OPTION #1]
- 4) Remove existing varnished cambric lead high voltage cables "13-31" and associated supports as indicated on Drawing CD-0064-COF20195-ED-101 et. al. [BID OPTION #2]

### 1.04 SCHEDULE

NASA requires that all project work be completed nominally 523 calendar days from contract award, with final invoicing submitted by the Contractor within thirty (30) calendar days of this date. This completion date includes demobilization from the site, final site clean-up, and receipt/approval of all closeout documentation. The following depicts a notional implementation schedule based upon this milestone completion date.



### 1.05 GOVERNMENT FURNISHED INFORMATION (GFI)

- 1) The Government will furnish the following material and information as applicable to all project requirements. The Contractor shall comply with and incorporate into the design and construction all the listed materials and information. These documents are incorporated into this document as if fully rewritten. Note that some of the information may be retrieved electronically as represented by the associated web site.

- a) NASA Glenn Environmental Programs Manual (<http://www.grc.nasa.gov/WWW/FTD/EEMO/documents/epm-TOC.pdf>)
- b) NASA Glenn Occupational Health Programs Manual (<http://smad-ext.grc.nasa.gov/shed/pub/ohpm/ohpm-manual.pdf>)
- c) NASA Glenn Safety Manual, ([http://smad-ext.grc.nasa.gov/shed/pub/gsm/chapter\\_index.shtml](http://smad-ext.grc.nasa.gov/shed/pub/gsm/chapter_index.shtml))
- d) NASA GRC High Voltage Electrical Power System Operating Instructions
- e) NASA GRC Low Voltage Electrical Power System Operating Instructions

- f) NASA John H. Glenn Research Center Construction Contractor Manual, March 26, 2010
- g) NASA Pressure Systems Office (PSO) Certification Instructions and Checklists
- h) FY14 Central Compressed Air Systems Repairs, Phase 1, Drawings, 100% Submittal, Dated 1/17/2014.
- i) FY14 Central Compressed Air Systems Repairs, Phase 1, 100% Submittal, Specifications and Appendices, Volumes 1 & 2, January 2014.
- j) FY14 Central Compressed Air Systems Repairs, Phase 1, 100% Submittal, Design Analysis, Volumes 1 & 2, January 2014

## **1.06 PROCESS AND PROCEDURE**

### **1) Request for Information**

- a) The NASA Request for Information (RFI) process is a communication tool between the Government and the Contractor to facilitate the flow of information, project direction, change requests for design and construction, clarifications, interpretations, other miscellaneous issues and their respective resolutions. The Contractor shall use the RFI process in their conveyance of project issues to the Government for resolution prior to the execution of any subject work. NASA Form C-9c shall be provided to the Contractor for use and submission with the NASA RFI process. An issuance of a RFI does not automatically imply a cause for a Government approved change proposal.
- i) Requests for information shall be submitted electronically as provided under Section 01 33 00.98 Submittal Procedures. NASA will review and respond within 10 calendar days after date of submission.

### **2) Project Change Proposal Process**

- a) Change can and will occur on any project. Changes to the approved plans or specifications include revisions, deletions, additions, and substitutions to the work prescribed on the approved plans or specifications. Therefore, the change proposal process, in conjunction with subject RFIs established between the Government and the Contractor, shall support the negotiations and contract modifications required to adjust costs and schedule for the project.
- b) RFIs resulting in requested change proposals sponsored by either the Government or the Contractor (and their team) shall include the following information as applicable:
  - i) A reason for the sponsored change.
  - ii) Calculations, product cut-sheets, cost estimates, technical justifications, and other back-up information necessary to demonstrate the changes shall be submitted.
  - iii) The designer of record (DOR) related to the change shall professionally stamp and sign all documents presented. Note that all drawings must be stamped and signed; all sketches must be signed.
  - iv) Cross-reference and label all supplied documents to the subject RFI.

Changes resulting from construction errors and omissions shall be the responsibility of the Contractor and shall be documented with the NASA RFI process.

### **3) Equipment Logging Process**

- a) The NASA equipment recording process is the development of a list of demolished, modified, and new mechanical equipment for the GRC maintenance program. The Contractor shall provide project documentation in accordance with Section 01 78 00.98 Closeout Submittals and Section

01 78 23 Operation and Maintenance Data. Operations and maintenance data shall comply with the requirements of Data Package 5 as specified in Section 01 78 23.

4) Permits and Area Clearance

- a) The Contractor shall be responsible to obtain all permits and coordinate approvals through the NASA Project Team. Permits shall be managed as indicated in Division 01, Section 01 11 00.98 *Summary of Work* and the NASA Glenn Safety Manual prior to the execution of the subject work.
- b) For permits external to NASA (e.g. OEPA Notice of Intent), the Contractor shall provide the appropriate documentation, fund the permitted activities and obtain the permit approval prior to field operations.
- c) An Area Clearance is similar in nature to the other required safety permits in that the established process informs the subject system stakeholders, with signatories for those responsible from the project and systems, that their system will be affected by the project and for a defined duration. The NASA construction support team will complete and process form C-978 Area Clearance Authorizations to secure permissions for the proposed clearance. This process may take up to ten (10) working days. The Contractor must consider this processing time in the project planning and provide the necessary notification to NASA for initiation of the Area Clearance Authorizations. Failure to provide adequate notification to NASA shall not be cause for compensable delay.

5) Electronic Submittals [Section 01 33 00.98]

- a) The Contractor shall transmit to the NASA Project Manager or appointed designee for review and approval submittals of the various contract documents in accordance with Section 01 33 00 *Submittal Procedures*.
- b) An electronic submittal process will be utilized for all project submittals. The Government has established, and will provide access for the Contractor to, an electronic Document Management System (EMC Corporation eRoom). All project submittals will be submitted, managed and returned through this eRoom process.
- c) Representatives of the prime Contractor will be given access to the eRoom. Those granted access to the eRoom shall be required to obtain NASA IT security clearance and are required to complete on-line security training (approximately one hour in length) in order to achieve security clearances required to access the eRoom. Subcontractors will not be granted access to this eRoom therefore the prime Contractor shall be responsible for managing the flow of information into and out of the eRoom for the Contractor's team needs. NASA will supply the Contractor with instruction and guidance on using the eRoom submittal process.
- d) A Submittal Log within the eRoom is used to document the submittal approval process. Propagating data in the Submittal Log will be performed by the Government. The Contractor shall upload submittals (in Adobe PDF format) into the eRoom into a single designated folder. Subcontractors will not have access to eRoom; electronic submissions to the Government will be performed by the prime contractor only. The Government will create an entry for each submittal in the Submittal Log showing information such as submittal number, assignees, approval codes, and related dates. The entry will be shown as "Open" while the review is in progress. The change of a submittal entry from "Open" status to "Closed" status is the indication to the contractor that the review is complete and the submittal is finalized. Government comments and final approval codes will be entered into each entry for use by the contractor (no hard copies of comments will

be provided). Submittals shall be completely in electronic format, unless otherwise indicated, until the submittal is approved.

- e) The submittal numbering format shall be approved by the Government and shall be based on the specification section requiring the submittal. Each submittal number shall contain a numerical suffix to be used to indicate resubmittals, such that the original submittal number can remain unchanged from original submission to final approval if resubmittals are required. Submittals containing more than one referenced specification section will be rejected. A standard transmittal form approved by the Government shall be used to transmit each submittal and shall be the first page of the submittal.
- f) All drawings, disks, and other documents submitted by the Contractor in non-electronic form shall be sent directly to:

National Aeronautics and Space Administration  
John H. Glenn Research Center  
Facilities Division, M.S. 21-15  
21000 Brookpark Road  
Cleveland, OH 44135  
ATTN: Jeffrey A. Chambers

Correspondence not submitted electronically shall be forwarded in quadruplicate to the address above with a transmittal letter bearing the NASA contract number.

- g) Each submittal will be reviewed by the NASA project team and returned to the Contractor within ten (10) working days after receipt. All changes will be reviewed for incorporation into the construction.
  - h) All NASA comments are to be incorporated unless specifically excepted by the Contractor in writing and with acknowledgement by the Government. The Government shall have the final decision authority on incorporating changes even if they bear cost and schedule.
- 6) Government Inspections for Quality Assurance and Safety - NASA, during the course of this project, will be providing its own team of Quality Assurance Technicians, Engineers and Inspectors to represent the interests of the Government. This action does not relieve the Contractor from providing its own team for Safety, Quality Assurance and Quality Control. The Contractor shall make all areas of the overall project available daily to the NASA Project Team and designees during normal business hours, extended/off hours and by request. All contract documents shall be made available on-site to the NASA Project Team members at all times, which is in concurrence with or in addition to the contract and the Division 01 Specifications. The NASA Project Team or designees will provide a representative(s) for all Government witnessing on project elements such as but not limited to site safety, factory acceptance testing, third party tests, soil proctors, material and equipment installations, pressure testing, equipment activation, etc. The Contractor shall not cover or otherwise obscure any project work prior to the witnessing of the Government. Full coordination and cooperation between the NASA Project Team and Contractor team is required for Government inspections.
- 7) Many routine processes, procedures and information critical to executing construction activities at Glenn Research Center are summarized in Construction Contractor Manual [Section 1.05(f) above]. The Contractor is responsible for ensuring compliance with those processes and procedures by all members of the Contractor's team.

## **PART 2 PRODUCTS**

### **2.01 DRAWINGS**



- 1) A "shop drawing" as defined for this project is a drawing or set of drawings produced by the contractor, supplier, manufacturer, subcontractor, or fabricator to facilitate the contract work with the appropriate connections, fabrications, layouts and product specifics. This type of drawing shall be provided to the COR as called for in the project specifications or this document.
- 2) A "coordination drawing" as defined for this project is a drawing or set of drawings produced by the contractor critical to the management of the installation and shop drawings of the trades (e.g. steel work, sheet metal ductwork, piping, plumbing, fire protection, electrical, etc.). This type of drawing shall be provided to the COR as required to execute the project, clarify items supplied and to reduce or best eliminate rework, errors and omissions.

## **2.02 CONSTRUCTION SCHEDULES**

### **1) Construction Schedule**

Prior to the start of work, prepare and submit to the Contracting Officer for acceptance a construction schedule in the form of a Critical Path Method (CPM), Network Schedule in accordance with the terms in Contract Clause "FAR 52.236-15, Schedules for Construction Contracts," and as modified in this document.

The Contractor shall use the critical path method (CPM) to schedule and control construction activities. The schedule shall have a break down tasks with planned durations greater than ten (10) calendar days. The scheduling software that will be utilized by the Government on this project is Microsoft Project 2010®. Notwithstanding any other provision in the contract, schedules submitted for this project must be prepared and submitted by the Contractor. Submission of data from another software system where data conversion techniques or software is used to import into scheduling software is not acceptable and will be cause for rejection of the submitted schedule. The schedule shall identify as a minimum:

- a) Manufacturing and construction time for all major systems and components
- b) Each activity shall be assigned its appropriate Responsibility Code
- c) Each activity shall be assigned its appropriate Phase Code
- d) Major submittals and submittal processing time
- e) Major equipment lead time

The Contractor shall submit all network analysis and updates<sup>1</sup> in hard copy and on electronic media that is acceptable to the NASA Project Manager. The project schedule will also be posted in the format specified as an Adobe PDF file with no relationship lines displayed in the graphic. The network analysis system shall be kept current, with changes made to reflect the actual progress and status of the construction.

Update the construction schedule and equipment delivery schedule at monthly intervals or when the schedule has been revised. Reflect any changes occurring since the last update. Submit copies of the purchase orders and confirmation of the delivery dates as directed.

### **2) Equipment Delivery Schedule**

Within 30 calendar days after acceptance of the construction schedule, submit for Contracting Officer acceptance a schedule showing procurement plans for materials and equipment with individual procurement costs in excess of ten thousand dollars (USD) or estimated delivery times in excess

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<sup>1</sup> Schedule updates shall be produced to reflect the current status of the project and to forecast the future activities. All schedule updates shall reflect the project baseline as submitted prior to the start of work and shall reflect changes in the project schedule relative to this project baseline. Project schedules shall not be 're-baselined' without the approval of the NASA Project Manager or NASA Contracting Officer.

thirty (30) calendar days. Submit in the format and content as prescribed by the Contracting Officer, and include as a minimum the following information:

- a) Description
- b) Date of the purchase order
- c) Promised shipping date
- d) Name of the manufacturer or supplier
- e) Date delivery is expected
- f) Date the material or equipment is required, according to the current construction schedule.

### 2.03 CONTRACT SCHEDULE OF VALUES

The Contractor shall prepare and submit for approval a Schedule of Values for the project. Each project element shall be separately decomposed according to the Work Breakdown Structure (WBS). The Schedule of Values shall include the following: Items under each milestone, Unit Quantity, Unit of Measure, Unit Cost (Labor), Total Cost (Labor), Unit Cost (Material), Total Cost (Material) and Total Item Cost. Shipping costs shall be added to the total material cost. Supervision, overhead, profit, and bond shall be added to the compiled costs. The Schedule of Values shall be based on AIA Document G702 and G703 or other NASA approved form.

The Government shall withhold two percent (2%) of the contract value for the final acceptance punch list, as-built drawings and O&M manuals, totaling six percent (6%) of the contract value, and pay on these line items only when the submission of each item is 100% complete and accepted by the Government. The Schedule of Values shall include specific line items for the each of these withholdings.

The contractor shall establish within the proposal, the overhead (OH), profit (P) and commission to be applied throughout the term of the project (see Table 1). These percentages shall become fixed upon award of the contract and are to be those used when seeking equitable adjustments (e.g. change orders) throughout the duration of the project.

Table 1 - Overhead, Profit and Commission

	Overhead (%)	Profit (%)	Commission (%)
Prime Contractor, work performed by others			
First Tier Subcontractors, work performed by others			
Prime and First Tier Subcontractors, work performed by their own forces			

The overhead percentage cited shall be considered to include all indirect costs including, but not limited to, field and office supervisors and assistants, incidental job burdens, small tools, and general overhead allocations. "Commission" is defined as profit on work performed by others.

Not more than four percentages for overhead, profit, and commission shall be allowed regardless of the number of subcontractor tiers.

The Contractor or subcontractor shall not be allowed overhead or commission on the overhead, profit, and/or commission received by its subcontractors.

Equitable adjustments for deleted work shall include credits, limited to the same percentages for overhead, profit, and commission.

### 2.04 CONSTRUCTION IMPLEMENTATION PLANS

- 1) The Contractor shall prepare a comprehensive *Construction Implementation Plan* which shall include, but need not be limited to, the following outline items:

- a) Project description
- b) Construction periods
- c) Personnel impact
- d) Utilities impact
- e) Research impact
- f) Other conditions or hazards
- g) Safety review
- h) Personnel contacted
- i) Required permits and forms
- j) Security requirements
- k) Special considerations, e.g. soil sampling, notifying building occupants
- l) Off-hour work
- m) Equipment relocation/delivery
- n) Parking/circulation impact
- o) Road, Parking Area, and Walk Closure Plans.
- p) Traffic and Pedestrian Detour Plans.
- q) Contractor's Quality Control and Configuration Management Plans

The Contractor shall prepare the *Construction Implementation Plan* and submit the plan to NASA for review and concurrence within thirty (30) calendar days of contract award.

## 2) High Voltage Safety Permitting

Unique to the safe execution of work at Glenn Research Center is the planning and permitting of high voltage electrical work. Glenn considers voltages equal to and greater than 600 volts as 'high voltage'. Prior to initiating any high voltage electrical work, the Contractor is required to secure a high voltage safety permit from the GRC Electrical Applications Safety Committee (EASC). This safety permitting process is similar to the general safety permitting process described in the Glenn Safety Manual, Chapter 1A Glenn Safety Permit System and as further augmented under Chapter 8 Electrical Systems Safety. In order to secure a high voltage safety permit for the project the Contractor shall prepare and submit a comprehensive High Voltage Implementation Plan (HVIP) and present the contents of that plan to the EASC for review and approval. The contents of the HVIP include:

- a) Isolation requirements and plans
- b) Grounding requirements
- c) Personnel protective equipment (PPE) requirements
- d) Equipment protection requirements
- e) Testing and activation requirements
- f) Training requirements

Though a singular permit will be issued for the project as a whole, work elements of the project will be managed at a more discrete level to insure the safe execution of the work. The work groups may be definitized as follows:

- a) Rewind of compressor C4.
- b) Demolition of VFMG2 and Liquid Rheostat system.
- c) Demolition of VFMG2 power cables YJ4TAP1 and WJ4B1, 2.
- d) Demolition of all VFMG2 controls and relaying and post demolition testing.
- e) Rehabilitation of breakers WJ4B and WJ4B1A and replacing all breaker relaying and controls.

- f) Installation and testing of SA24, new power cable WJ4B1A1, its isolation transformer J4B1A1, its soft starter WJ4B1A1A, and PF correction capacitors.
  - g) Integrated system testing (IST) for each element of new construction
- The Contractor may propose a different division of the high voltage work elements that suits the Contractor's proposed implementation plan.

## **2.05 REPORTING**

### **1) Weekly Project Meetings**

- a) The Contractor shall attend weekly project meetings scheduled by the Government. Subcontractor representatives shall attend.
- b) The Contractor shall prepare a Two-Week Planning Schedule for discussion at each weekly project meeting, highlighting construction progress, utility outages, material deliveries, subcontractor's equipment onsite, coordination issues and updates to the baseline schedule. Meeting minutes shall be kept by the NASA Construction Manager and distributed after signed concurrence by the NASA Project Manager and the Contractor.

### **2) Monthly Progress Reporting**

- a) The Contractor shall provide a monthly progress report with each payment request after the Contract Award. The monthly project progress report shall include the name of the project, name of the Contractor(s), date of the report, reporting period and a brief project description. The Monthly Progress Report shall cover five specific areas as listed below:
  - i) A description of technical progress and accomplishments, problems encountered and planned solutions for the existing reporting period and progress planned for the next period.
  - ii) An updated copy of the project schedule showing progress against the baseline plan with the critical path(s) identified.
  - iii) Descriptions of major construction changes with a summary statement of resulting cost and schedule impacts.
  - iv) An updated cost report showing actual costs for the reporting period, cumulative costs, budgeted costs, and projected costs.
  - v) A discussion of Administration, Project Management or other items which are pertinent to the reporting period.
  - vi) A summary of safety related issues pertinent to the reporting period and task as a whole: mishap reports, hazardous materials or confined space work performed, documentation prepared or required, identification of upcoming work that needs safety preparation, etc.

## **PART 3 EXECUTION**

### **3.01 ORDER OF PRECEDENCE**

- 1) The project has established an Order of Precedence for the various contractual documents and their roles in resolving requirement issues. Any inconsistency in this document, solicitation or contract shall be resolved by giving precedence in the following order:
  - a) Government Request for Proposal
  - b) Contractor Proposal
  - c) Government Contract and Contract Modifications
  - d) Project Drawings
  - e) Project Specifications
  - f) Project Submittals

For instances where specification section to specification section differ, the more stringent

requirement(s) shall apply in all cases.

### **3.02 CONFERENCES AND MEETINGS**

- 1) After the award of this contract and prior to beginning of construction, an initial conference (Pre-Construction Meeting) between the Contractor team and the NASA team, will take place at the NASA Glenn Research Center. The NASA Project Manager shall organize the session and coordinate with the Contractor for attendance. The Government has the following desired outcomes with the Pre-Construction Meeting:
  - a) Interaction between the Contractor and all client representatives with the NASA Project Team.
  - b) Achieve consensus from the NASA Project Team on any issues and concerns with the Contractor's Proposal and the End User's functional requirements.
  - c) Establish and explain policies and procedures for the completion of a successful project.
  - d) Establish clear lines of communication and points of contact (POCs) for Government and Contractor team members.
  - e) Outline critical elements and milestones of the project implementation (e.g. staging of work such that Center operations are minimally impacted).
  - f) Establish the project schedule, submittal processing and preliminary construction schedule.
  - g) Establish clear expectations for systems activation and turnover from the Contractor to the Government.
- 2) Scheduled project conferences for construction progress will be held at Glenn Research Center. Scheduled project meetings shall include but are not limited to the information described in Division 01, Section 01 31 19.98 *Project Meetings* and other sections of this document.
- 3) Other meetings and electronic communications between Contractor's representatives and the NASA project team shall take place to assure complete communications and agreement of ideas and expectations to achieve the final objectives. The Government shall establish an on-line shared folder website, known as eRoom – FY14 Central Compressed Air Systems Repairs, Phase 1, to be accessible by designated NASA and Contractor project personnel. The files contained therein shall be in Adobe® PDF or Autodesk® DWF format where practical so as to aid in dialogue but prohibit unauthorized revisions.
- 4) The Contractor shall be responsible for taking notes at all conferences and meetings except as indicated in Division 01, Section 01 31 19.98. Pertinent items in telephone conversations between the Contractor's representatives and NASA project team shall be included in these notes. Notes of conferences, meetings, and telephone conversations shall be submitted within five (5) working days of the occurrence. The Contractor shall acknowledge, in the conference notes, transmittal of any material between parties, submit copies of any correspondence pertinent to the execution of the contract, and provide a brief statement of job progress. The above information shall be transmitted to the COR via e-mail (ATTN: Jeffrey.A.Chambers@nasa.gov) for forwarding to the NASA project team as required. If the NASA project team has any comments concerning the notes, they will so advise the Contractor within five (5) working days of receipt of the notes, and these comments shall be included at the beginning of the next scheduled set of notes.

### **3.03 PROJECT DELIVERABLES**

- 1) Site Specific Safety and Health Plan
  - a) NASA policy requires that Contractors submit site specific safety and health plans (SSHASPs) as part of the contract and as described in Division 01, Section 01 35 26.98 *General Safety Requirements*. The plan will demonstrate the seriousness of the Contractor's intent to excel in its implementation of its safety and health program as an early indicator of its safety culture. The requirements of the plan's content emulate the elements of OSHA's Voluntary Protection Program and as such represent all the elements of a successful safety and health program. The

Contractor shall submit the SSHASP to NASA for acceptance prior to any field implementation. The Contractor may update the plan at any time or at the direction of the Government. Revisions are subject to Government review and approval prior to the execution of any subject field operations.

- b) The SSHASP shall include a fall protection plan, specifically addressing the fall hazards associated with the scope of work in accordance with Chapter 34 of the Glenn Safety Manual.

## 2) Quality Assurance / Quality Control (QA/QC) Plan

The Contractor shall submit for record within thirty (30) calendar days of contract award, a Quality Assurance and Control Plan demonstrating an effective quality control program. This document should define the Contractor's plan to apply relevant assurance principles and techniques to ensure the project will be successfully accomplished and the applicable contract requirements and specifications will be satisfied. The plan shall identify all elements of the quality assurance organization, and describe the objectives, implementation policies and procedures, and configuration control systems utilized throughout design, development, fabrication, delivery, and commissioning to provide quality products and materials.

## 3) Closeout Documentation

The Contractor shall prepare and submit project closeout documentation in accordance with Section 01 78 00.98 *Closeout Submittals*.

- a) The Contractor shall maintain a set of drawings, which depicts the actual as-built conditions of the completed construction, appropriately marked (red-lined) with changes, modifications and deviations that have been encountered and incorporated (as-built) in the features of work. These red-line drawings provide the project with a permanent record of each project feature. The working as-built drawings must be available on-site at all times throughout the duration of the project and must be available for review by NASA or its designee at any. At the completion of the project, this set of as-built drawings shall be submitted in accordance with Section 01 78 00.98 *Closeout Submittals*.

## 4) Personnel Training on Installations

The Contractor shall provide comprehensive training on the installed equipment and software for the Government's personnel and representatives in the operation, configuration, and maintenance of the systems. The training shall include all manuals and materials required for the training. The training shall be conducted by those directly experienced with the installed equipment and software, and shall be of sufficient depth that the trainees will be qualified to operate, maintain, troubleshoot, and train future operators in the systems furnished. Training duration shall be as per the approved project specification for each subject facility system.

### **3.04 SYSTEMS ACTIVATION, VALIDATION AND COMMISSIONING**

Activation as defined by NASA includes the installation of ground support equipment, the integration and checkout of combined facility and equipment systems, installation of non-collateral equipment, and demonstration and acceptance of an operable system.

Validation as defined by NASA is the verification that the equipment and/or systems meet the operational needs of the Government. It is part of the turnover process from the constructor to the Government.

Commissioning is defined as the systematic process of ensuring that the complex array of sub-systems and systems is constructed and tested to perform according to the design intent, requirements, and the owner's operational needs. The following verification and test activities, when combined, will establish a

“commissioned” system:

- 1) The Contractor shall provide a detailed System Validation Plan, submitted to NASA for approval, which reflects the listings of all systems, subsystems, components and procedures that have been provided for this project. The following shall be included in the Contractor’s developed plan:
  - a) Develop check lists prior to conducting tests. These check lists shall be used for component, sub-system and system level demonstration tests. Where applicable, specific consideration shall be given to the safe operation of systems and for the safety of personnel and property as specified by the Glenn Safety Manual and Job Hazards Analyses (FHAs).
  - b) The systems are installed and functioning in accordance with contract drawings and documents, including local and remote controls. These may include P&ID’s, plans, specifications, vendor prints, installation instructions, and other documents as appropriate.
  - c) The required documentation is obtained for each item. Relevant documentation (i.e. operating manuals, maintenance procedures, standard operating procedures (SOPs), and record drawings) are referenced here. The documents included are those that are required to operate and maintain the system in its commissioned state. The stakeholder responsible for maintaining the documents are also identified.
  - d) Verify that all manufacturer set points and limits function properly
  - e) Critical instruments have been calibrated in accordance with contract documents. Demonstrate that requirements for calibration have been met and that all records for calibration are maintained.
  - f) Instruments and equipment shall be properly identified. The identification shall include the tag number and P&ID drawing number as a minimum. The identification may further include manufacturer and model number, serial number, motor HP and RPM for each device per contract documents.
  - g) Critical materials of construction match the contract documents.
  - h) Contractor to verify all equipment, piping, valves, and joints are installed such that no forces or strain are exerted to surrounding equipment or systems. Proper flexible connections have been installed per contract documents.
  - i) Initial cleaning, pressure testing, and other specified pre-operational tests have been completed and documented according to contract documents prior to request for final commissioning.
  - j) Utility tie-ins are verified.
  - k) All electrical and control wiring labeling have been verified. Wiring shall be properly identified on both ends with the system information. Each wire shall have a unique number. The number shall be on each end and prominently displayed.
  - l) Control system I/O and electrical point-to-point have been verified and documented.
  - m) Leak testing has been conducted in accordance with the contract documents.
  - n) The system controls field installation has been checked out and documented by the Contractor, including loop checks and calibration of all critical loops, and failure mode testing.
  - o) Automation systems contain all points and loops referenced in the contract documents as appropriate to monitor and control the systems.
  - p) Verify installation of all instrumentation, monitoring devices, and adherence to installation instructions, plans, and vendor prints for the systems.
  - q) Verify communication between the Contractor-supplied control system with the Distributed Control System.
- 2) Equipment and sensors necessary for commissioning and verification check-out of the facility shall be provided by the Contractor. Provided instruments shall be calibrated and certified.
- 3) Signal conditioning shall be provided by the Contractor.

The Contractor shall provide manufacturer's representatives for commissioning of the new equipment.

Coordination between the Contractor team and NASA Project Team will be required to facilitate the system connections and startup of the various institutional and process systems at various milestones through the life cycle of this project.

After the Contractor's System Validation, the systems shall undergo a NASA Integrated Systems Test (IST) that shall be performed by the Contractor and NASA Operations Team. The IST is an orderly testing sequence selectively followed to verify that a piece of equipment and/or system is ready to be safely operated. The Contractor shall provide engineering, technical and/or skilled support and lead the effort to verify that the equipment meets the requirements and specifications as indicated in this and other applicable documents. The Contractor is expected to read and understand the requirements set forth within Volume 2 of the Specifications, Appendices H through M.

### **3.05 SPECIAL CONSTRAINTS AND REQUIREMENTS**

#### **1) Safety & Health Competent Person**

The Contractor shall provide a Safety & Health Competent Person(s) who shall be present during the execution of all work at the site. The minimum qualifications for the Safety & Health Competent Person are:

- a) Minimum of at least five (5) years of experience as an Occupational Health and Safety Professional (competent person) in the construction field. This shall include field experience as well as time in the office preparing Health and Safety Plans. Demonstrated knowledge of job hazard recognition for construction. Demonstrated knowledge in performing Job Hazard Analysis (JHA).
- b) OSHA 30-Hour Construction Training (Mandatory)
- c) AIHA "Fundamentals of Industrial Hygiene" (Preferred)
- d) 40-Hour HAZWOPER Training (Preferred)
- e) Asbestos Hazard Evaluation Specialist and Asbestos Hazard Abatement Specialist Certification (Mandatory; may be third party during related activities)
- f) OSHA "Excavation, Trenching and Shoring (Mandatory)
- g) OSHA "Fall Protection and Fall Arrest Systems (Mandatory)
- h) OSHA "Scaffolding" (Mandatory)

The Contractor's superintendent may serve in dual capacity as the Safety & Health Competent Person so long as that superintendent possesses the minimum (mandatory) qualifications stated above.

Training records and certifications shall be submitted in accordance with the project specifications.

A Notice to Proceed (NTP) will be issued after the Contractor's SSHASP is approved by NASA. No site work shall begin without a NTP letter signed by the Contracting Officer.

#### **2) Project Closeout**

A Final Acceptance Punch List (FAP) shall be used by the Contractor and NASA to manage the acceptance of the project. The Government shall be responsible to develop the punch list during the course of the project, including any stakeholder sponsored items. The Contractor shall facilitate the execution of the complete list to the satisfaction of the Government prior to final payment.

FAP sessions shall start a minimum of ninety (90) days prior to project completion and shall consist of weekly meetings or walk-throughs to detail the status of the items documented.

#### **3) Interruption of Services**



- a) It is intended that all work will be completed while the service air system, and Building 64 in general, remains in operation. Two fault (double) isolation must be maintained between active systems and work points. This may require the installation of paddle blinds, blind flanges or additional isolation valves to achieve double isolation. The Contractor shall thoroughly review the intended work scope and consider these requirements in the isolation plan.
  - b) It is intended that all work be performed without interruption to the normal activities of the Center. Planning will require second shift, third shift or weekend work and protection of areas not directly involved in individual construction line items. The disruption, tie in and restoration of utilities and services must be carefully scheduled, planned and approved by the Government to minimize the impact to the Center operations. Loss of function to any branch/end user shall be limited to a maximum of 48 hours.
  - c) NASA maintenance and research operations personnel periodically need access to valves, equipment and services in the immediate work area (e.g. overhead doors). The Contractor must ensure that this accessibility for continuation of services is maintained during construction activities.
  - d) NASA GRC's on-site maintenance contractor shall be responsible for the opening and closing of all valves in existing systems, which will be scheduled through the NASA Project Team as needed. The contractor is not permitted to operate existing valving. The coordination of this activity is managed through the GRC Area Clearance process as explained in the *Construction Contractor Manual*. The Contract shall review and adhere to the NASA Lock Out / Tag Out (LOTO) requirements presented in Chapter 9 of the Glenn Safety Manual.
- 4) Government personnel, equipment and property must be protected from damage during construction. The Contractor is expected to read and understand the Glenn Safety Manual.
  - 5) Temporary fall protection measures must be erected by the Contractor in accordance with OSHA regulations. Scaffolding erected by the Contractor is subject to review and approval by NASA, to ensure the safety of workers. When erecting scaffolding, the Contractor shall address accessibility, anchor points, load capacity, etc., as well as the safety of personnel and equipment below. Under no conditions will workers be permitted to scale or use as work points the existing piping or conduits. These fall protection measures shall be addressed in the Contractor's HASP and based upon a thorough inspection of the work site by the Contractor.
  - 6) The Contractor shall provide temporary power, lighting and ventilation throughout work areas as needed to ensure safe and productive working conditions. Temporary electrical circuits shall not be installed in any electrical panel without the express permission of NASA. All temporary provisions shall be completely removed by the Contractor upon project completion.
  - 7) The Contractor shall provide protection for personnel and equipment when working near live electrical equipment. Electrical equipment, including suspended cable trays, shall be protected in a manner that prevents damage from inadvertent contact/collision, falling objects, hot work (e.g. sparks, weld slag, etc.) and leaks/spills.
  - 8) NASA does not permit the following activities during normal business hours that could endanger building occupants, bystanders, visitors or others:
    - a) Pneumatic testing of pressure or process systems
    - b) Radiographic examination or testing

These activities must be scheduled for off-hours (e.g. 2<sup>nd</sup> or 3<sup>rd</sup> shift) or weekend shifts. Approval of requests for off-hours activities is subject to NASA operational schedules and will be considered on a case-by-case basis. NASA shall incur no additional costs for performing these activities during off-hours or weekend shifts.

9) Temporary Utilities

- a) The Contractor is responsible for providing telecommunications, fax, computer and copying services that are needed for the duration of the project.
- b) The Contractor shall notify NASA of the intent to place temporary office trailers, portable toilets and dumpsters (number and size for each). Contractor's temporary facilities (e.g. trailers, restrooms, etc.) layout will require the approval by the COR prior to mobilization at the project site.
- c) The Contractor shall also notify NASA of any staging and lay-down area requirements. NASA will assign areas to be used for these purposes.
- d) No connection shall be made to any NASA utility without the express written approval of NASA.

10) Materials and equipment not designated to be salvaged, re-used or returned to the Government shall become the Contractor's property and shall be removed from the site as it accumulated. Contractor personnel shall handle, store, and protect removed items that are to be reused in the work.

11) NASA has engaged location-based professional photographic services to document the conditions and progression of the project. The project record will be updated at least once monthly throughout the duration of construction and at significant milestones. Coordination of these photographic services will be made by others; however the cooperation of the Contractor is required. The Contractor shall:

- a) Permit access to work areas by the photographers as needed. [Note: The photographers will be operating under the provisions of a job hazard analysis prepared by others and reviewed/approved by NASA.]

12) Site Access - All personnel that enter the Glenn Research Center (GRC) must comply with all security protocols. No animals, guns, knives or other weapons are permitted at GRC.

No person is permitted access to the GRC without a visitor's pass or a worker's badge (temporary or permanent). All workers and site visitors will have to receive badges. Each and every person entering the gate must have a government issued photo ID (driver's license, state ID, etc.). All visitors, workers, and employees must display their badges at all times while onsite.

- a) Visitors (Non-workers) - All contractor visitors require a visitor's pass for access to the GRC. The contractor is to give prior notice of the visit with the following information:

- i) Visitor's full name
- ii) Company the visitor represents
- iii) Nationality (must be a US citizen)
- iv) Date of the visit
- v) Time of arrival
- vi) Duration of the visit (how many days the visitor will be consecutively on site)
- vii) Location(s) of the visit (building number(s))
- viii) Sponsor (the sponsor is responsible for the safety of the visitor)

- b) Construction Workers (<15 days) - This process will be used for any worker who requires access for 14 days or less. The contractor is to give prior notice with the following information:

- i) Worker's full name

- ii) Company the worker represents
  - iii) Nationality
  - iv) Date and time of arrival
  - v) Duration of the work (how many days the worker will be consecutively on site)
  - vi) Location(s) of the work (building number(s))
- c) Construction Workers (15-180 days) - Any worker requiring access for more than 15 and less than 180 days will be issued a Temporary Workers Badge. Temporary Worker Badges will never be issued for longer than 90 day durations. The issuance of this badge requires specific information from each worker including (but not limited to):
- i) Worker's full name
  - ii) Social Security Number
  - iii) Date of Birth
  - iv) Citizenship
  - v) Birthplace
  - vi) Personal contact information (phone, address and email)
  - vii) Company contact information (phone and address)
  - viii) Worker's title
  - ix) Date and time of arrival
  - x) Duration of the work (how many days the worker will be consecutively on site)
  - xi) Location(s) of the work (building number(s))
- A criminal background check will be conducted on the worker. Once the criminal background check is approved, the worker will be contacted. In order to complete the badging process a photo, fingerprinting, and verification through two forms of ID will be required.
- d) International visitors or workers require specific paperwork that will take approximately six weeks to process.
- e) Deliveries - All deliveries require prior notification to NASA Security. The Contractor shall notify NASA Visitor Control of the following information:
- i) Name of the delivery company
  - ii) Who the delivery is to (The Contractor is required to receive all deliveries)
  - iii) Where the delivery is going (building, etc.)
  - iv) The name of the driver
  - v) The date and time of the arrival

Prior to the beginning of construction the QAS will instruct the contractor on required truck routes through the GRC. All drivers should be notified of the required routes.

The Contractor is responsible for receiving all deliveries. The Contractor is responsible for unloading all deliveries, and NASA equipment cannot be used for unloading. Note that many facilities at the GRC do not have loading docks.

Deliveries shall only be scheduled between the hours of 7:00AM and 3:45PM on normal work days. Deliveries arriving outside of these hours may be held at the delivery inspection site or denied entry to the Center altogether. The Government shall not be responsible for costs or schedule delays incurred as a result of deliveries delayed or denied outside of these established hours.

- 14) Property Passes - Any materials, instruments, parts, supplies, machinery, tools or equipment require a property pass in order to remove them from the GRC. The NASA Construction Manager or a designee will provide the property pass after they have inspected the vehicle and cargo. A copy of the Property Pass must be given to the guards at the gate by the driver before leaving the GRC.
- 15) Standard Operating Hours and Federal Holidays - The standard hours of operation for GRC are 6:00 am till 6:00 pm, Monday through Friday. Normal construction hours are 7:00am to 3:30pm. If additional work outside of this time is required, the contractor must coordinate this with the NASA Construction Manager at least 24 hours prior to working an extended shift.

Work shall not be planned or scheduled for the following federally recognized holidays:

- a) New Years Day
- b) Martin Luther King Day
- c) Washington's Birthday (Presidents Day)
- d) Memorial Day
- e) Independence Day
- f) Labor Day
- g) Columbus Day
- h) Veterans Day
- i) Thanksgiving Day
- j) Christmas Day

Access to the GRC outside of the standard operating hours requires prior notice with an After Hours Request form. This form is to be filled out and submitted to the NASA Quality Assurance Specialist (QAS) or Construction Manager (CM). NASA requires at least 24 hours prior notification of all After Hours work.

- 16) Prime Contractor Oversight - The superintendent is required to be onsite at all times that construction is occurring. The Contractor will provide 100% supervision over all construction on the project.
- 17) Bid Options - Provisions are made in the documents for "Base Scope" and "Bid Option" bid elements. These can be described as:
  - a. Base Scope – All work as specified in the documents not specifically designated or identified as a bid option.
  - b. Bid Option #1 – Rewind of Compressor C-4 5000HP Synchronous Motor as identified by drawings CD-0005-COF20195-A101 and –A102, Specification 26 90 00.00 Rewind Compressor C-4 Motor, et. al.

The Contractor shall propose as a fixed price amount for furnishing all services, labor and material for the base and bid option(s) individually.

- 18) Access to the equipment, systems and building areas shall be coordinated between the COR and the Contractor and shall include but is not necessarily limited to the following:
  - a. Parking will be congested during on-site construction due to the limited access around the project site. Coordinate designated locations for parking with the approval of the COR.
  - b. Fencing shall be erected to define a safe zone around the project site but allow access to specified locations and control pedestrian and vehicle safety as well as control site staging areas for equipment mobilization, scrap load-out, temporary material staging, and Contractors'

temporary facilities. The fencing boundaries shall be established by a representative site plan and with the approval of the COR.

- 19) Certain elements of integrated controls demolition and construction will be executed by NASA's on-site operations contractor (IMOC). The scope of these work elements are delineated in the project drawings by double-lined clouds, example CD-0064-COF20195-E911. Where this work encounters a common interface with the Contractor's work, the limits of hardware responsibility have been illustrated. In instances where the Contractor is bringing cables to IMOC hardware, the Contractor shall label, coil and leave the cables for IMOC to terminate and land. In instances where IMOC is bringing cables to the Contractor's hardware, IMOC shall label, coil and leave the cables for the Contractor to terminate and land. Any clarifications or exceptions taken shall be clearly presented in the Contractor's offer. Disputes or exceptions revealed post-award need not constitute compensable adjustments for either party.
- 20) NASA schedules annually a period of time to perform maintenance and upgrades on central service systems. During this 'maintenance shutdown' period, research efforts across the campus are curtailed so that service equipment can be taken off-line and serviced, repaired or upgraded. This annual maintenance shutdown is typically several weeks in length and presents to projects such as this an opportunity to perform work that might otherwise be considered as disruptive to normal operations. For the 2014 calendar year, this maintenance shutdown period is scheduled to occur beginning July 18, 2014 and extending through September 2, 2014. A similar period of time can be expected for the 2015 calendar year. The Contractor is encouraged to take advantage of this maintenance shutdown period for activities that would affect users and systems (e.g. high voltage electrical outages, air system isolations, tie-ins and taps, etc.).
- 21) High Voltage (> 600V) Electrical System Testing and Validation. High voltage electrical systems must be subject to detailed check out and testing before being permitted to be placed into operation. Switch gear such as that being installed for this project must undergo a structured point-to-point (P2P) validation test and structured integrated system test (IST). The contractor must plan and execute both of these tests for critical pieces of equipment in order to fulfill the requirements of the High Voltage Safety Permit process described earlier. Example test plans for the P2P and IST activities are included for reference. The Contractor is required to prepare and present these plans to NASA for review and approval prior to carrying out the activities. Allowances should be made for the standard submittal review cycle plus resubmission to address NASA comments.

## APPENDIX A ERRATA

The following modifications and corrections are made to the project documents:

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Specification 01 78 00.98  
Paragraph 1.2

Should include:

Please submit the following documentation with each ASME Pressure Vessel:

- 1) Manufacturer's Data Report (U-1 Form)
  - 2) Fabrication Drawings
  - 3) Design Calculations and Specifications
  - 4) Mill Test Reports / Impact Test Reports
  - 5) Inspection and NDE Reports
  - 6) Hydrostatic and/or Pneumatic Test Reports
  - 7) Welding WPS, PQR and WPQ
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Specification 22 15 14.00 40  
Paragraph 1.1

Should include:

### ASTM INTERNATIONAL (ASTM)

ASTM A105/A105M (2013) Standard Specification for Carbon Steel Forgings for Piping Applications  
ASTM A182/A182M (2013) Standard Specification for Forged or Rolled Alloy and Stainless Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High-Temperature Service  
ASTM A193/A193M (2012) Standard Specification for Alloy-Steel and Stainless Steel Bolting for High Temperature or High Pressure Service and Other Special Purpose Applications  
ASTM A194/A194M (2013) Standard Specification for Carbon and Alloy Steel Nuts for Bolts for High Pressure or High Temperature Service, or Both  
ASTM A312/312M (2013) Standard Specification for Seamless, Welded, and Heavily Cold Worked Austenitic Stainless Steel Pipes  
ASTM A403/A403M (2013) Standard Specification for Wrought Austenitic Stainless Steel Piping Fittings

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Specification 22 15 14.00 40  
Paragraph 2.1.1.2

Should include:

### 2.1.1.2 Stainless Steel

Pipe 6 inches and 10 inches shall be Schedule 10S, seamless, Type 316 stainless steel, conforming to ASTM A312/A312M, Grade 316, Type S.

Fittings shall be Type 316 stainless steel, butt welded, matched to pipe wall thickness, conforming to ASTM A403/A403M and ASME B16.9.

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Specification 22 15 14.00 40  
Paragraph 2.3.2 Page 7

Should read:

Seats and seals shall be resilient elastomer type, designed for field removal and replacement. Elastomers shall be Buna-N, ethylene propylene polymer, or chloroprene formulated for continuous immersion service at

275 degrees F minimum and shall be applied at least 10 percent below maximum continuous service temperature. Bonding adhesives shall comply with elastomer temperature requirements and shall have an effective life equal to or greater than the elastomer.

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Specification 22 15 14.00 40  
Paragraph 2.3

Should include:

Paragraph 2.3.7 Flanges

Carbon Steel: Flanges shall be used on piping exceeding 2 -1/2". These flanges shall conform to ASME B16.5 Class 150, shall be manufactured from ASTM A105/A105M forged steel, be of the weld neck style and have a raised face.

Stainless Steel: Flanges shall be used on piping exceeding 2 -1/2". These flanges shall conform to ASME B16.5 Class 150, shall be manufactured from ASTM A182/A182M forged steel, be of the weld neck style and have a raised face.

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Specification 22 16 19.26 20  
Paragraph 2.12.2

Should read:

All pressurized items shall be rated (and ASME stamped where applicable) for working pressure of 165 psig or more.

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Specification 22 16 19.26 20  
Paragraph 2.12.3

Should read:

Compressor air intake pipe from intake filter enclosure to compressor: ASTM A312/A312M type 316

stainless steel piping, schedule 10 or equivalent, flanged, welded with ER316L welding rod using TIG method and including expansion bellows.

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Specification 22 16 19.26 20  
Paragraph 2.13.1

Should read:

Pressure vessels should be ASME BPVC Section VIII U stamped for 165 psig from -20°F to 275°F.

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Specification 22 16 19.26 20  
Paragraph 2.13.3

Should read:

Provide flanges with raised faces at field piping connection locations.

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Specification 22 16 19.26 20  
Paragraph 2.13.3

Should read:

Piping in accordance with ASME B31.3 Normal Fluid Service and pressure tested at factory.

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Specification 22 16 19.26 20  
Paragraph 2.13.6

Should read:

Stainless steel or carbon steel shell stamped for 165 psig from -20°F to 165°F in accordance with ASME BPVC Section VIII Division 1.

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Specification 23 09 13.34 40  
Paragraph 1.1

Should read:

ASME INTERNATIONAL (ASME)

~~ASME B16.1 (2010) Gray Iron Pipe Flanges and Flanged Fittings Classes 25, 125, and 250~~

~~ASME BPVC SEC VI (2010) BPVC Section VI Recommended Rules for the Care and Operation of Heating Boilers~~

ASME B16.5 (2013) Pipe Flanges and Flanged Fittings: NPS 1/2 through NPS 24 Metric/Inch Standard

ASME BPVC Section VIII Division 1 (2013) Boiler and Pressure Vessels Code



ASTM INTERNATIONAL (ASTM)

ASTM A48/A48M (2003; R 2008) ~~Standard Specification for Gray Iron Castings~~

ASTM A105 (2013) Standard Specification for Carbon Steel Forgings for Piping Applications

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Specification 23 09 13.34 40

Paragraph 2.1

Construct, label, and install pressure-relief valve in accordance with ASME BPVC Section VIII, Division 1.

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Specification 23 09 13.34 40

Paragraph 2.2

Should read:

Provide with cast iron valve body conforming to ASTM A216/A216M with ASME B16.5 Class 150 flanges.

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Specification 23 64 26.00 98

Paragraph 1.1

Should include:

ASTM INTERNATIONAL (ASTM)

ASTM A105/A105M (2013) Standard Specification for Carbon Steel Forgings for Piping Applications

ASTM A193/A193M (2012) Standard Specification for Alloy-Steel and Stainless Steel Bolting for High Temperature or High Pressure Service and Other Special Purpose Applications

ASTM A194/A194M (2013) Standard Specification for Carbon and Alloy Steel Nuts for Bolts for High Pressure or High Temperature Service, or Both

ASTM A216/A216M (2012) Standard Specification for Steel Castings, Carbon, Suitable for Fusion Welding, for High-Temperature Service

ASTM A234/A234M (2013) Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service

ASTM F104 (2011) Standard Classification System for Nonmetallic Gasket Materials

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Specification 23 64 26.00 98

Paragraph 2.2.2

Should read:

Piping and fittings 1 inch and smaller shall have threaded connections. Piping and fittings larger than 1 inch and smaller than 2-1/2 inches shall have either threaded or welded connections. Piping and fittings 2-1/2 inches and larger shall have welded, or flanged connections.

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Specification 23 64 26.00 98  
Paragraph 2.2.2.1

Should read:

Use threaded valves and pipe connections conforming to ASME B1.20.1. Use threaded fitting conforming to ASME B16.3 and ASTM A197/A197M. Use threaded unions conforming to ASME B16.39. Use threaded pipe nipples conforming to ASTM A733.

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Specification 23 64 26.00 98  
Paragraph 2.2.2.2

Should read:

Flanges shall conform to ASME B16.5, Class 150 and ASTM A105/A105M.

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Drawing CD-0064-COF20195-M-601  
Piping Standards Schedule

Should include:

System – Service Air (SA) 125 PSIG

Pipe Size Range – 10", 16"

Pipe – ASTM A312 Type S, Grade 316, Schedule 10 Stainless Steel

Fittings (Note 1) – ASME B16.9 Wrought Stainless Steel Buttwelding Fittings, ASME B16.5 Class 150 Forged Stainless Weld Neck Raised Face Flanges

Joints – Welded or Flanged

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Drawing CD-0064-COF20195-E-001  
Additional Clarification to Demarcation of Responsibilities

### **RTU Cabinets**

The Contractor is not permitted to make terminations in existing RTU cabinets. The Contractor is to provide wire/conduit to the RTU cabinets and coordinate with NASA as required to have all terminations in RTU cabinets made by others. Sufficient wire length shall be provided by the Contractor for termination by others

### **Switchgear**

The Contractor takes complete responsibility for the gear. The line of demarcation between NASA and the Contractor is at the RTU cabinets (as described above).

### **Liquid Rheostat Demo**

NASA will coordinate with others to disconnect and identify wiring for demolition in RTU cabinets. The Contractor is responsible for demolition of the wiring and conduit once prepared for removal by others.

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